

No. 816,472.

PATENTED MAR. 27, 1906.

J. F. JOHNSON.
SPARKING IGNITION MECHANISM.

APPLICATION FILED OCT. 19, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

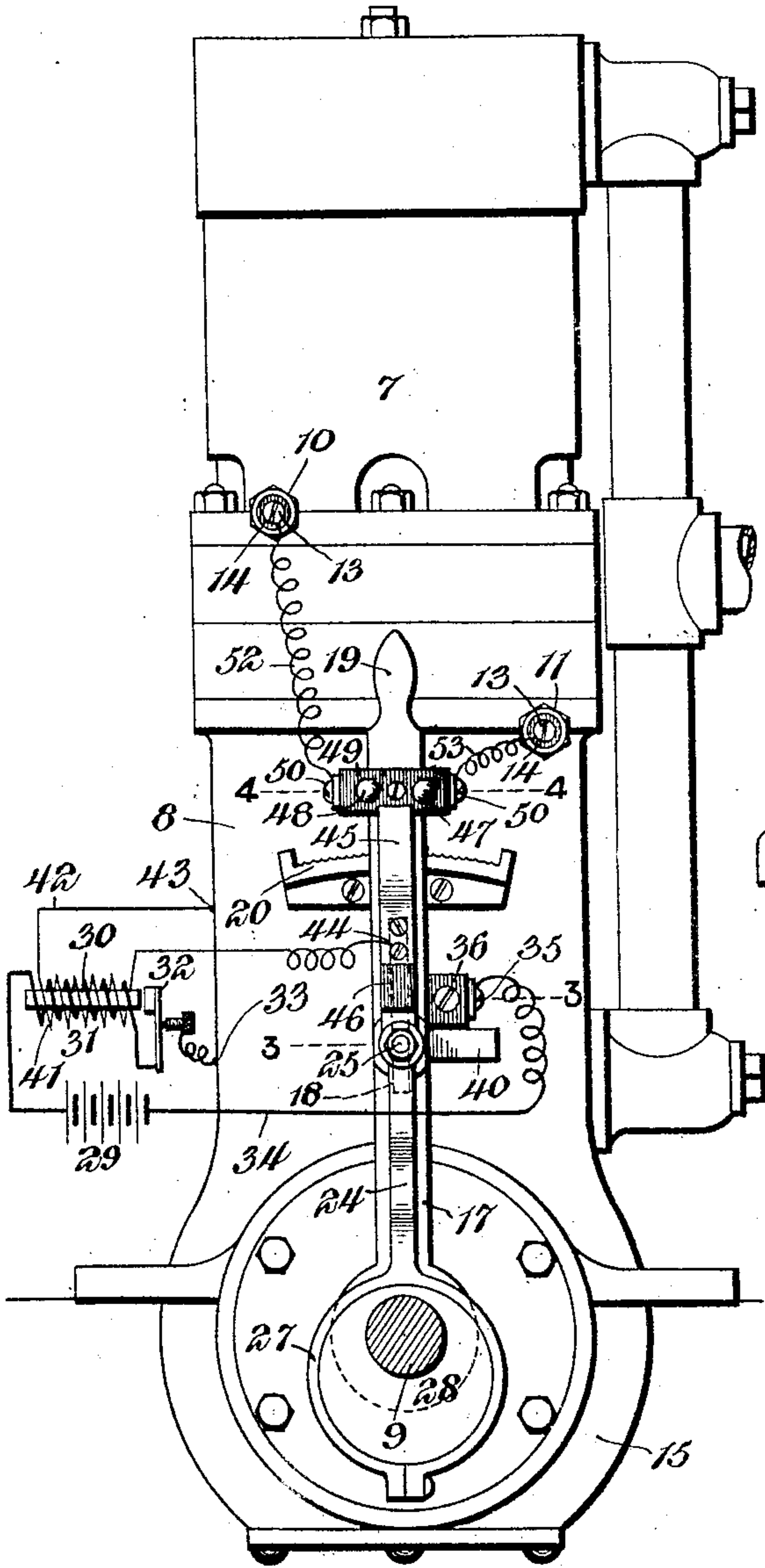
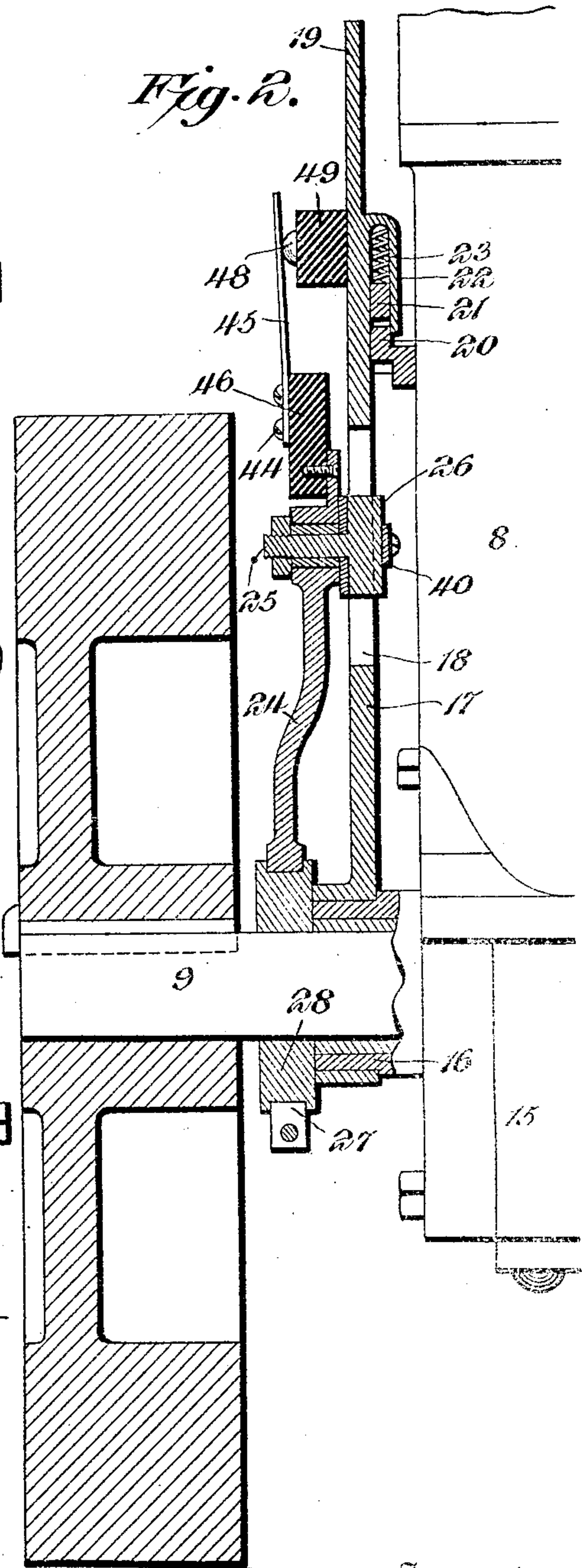



Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

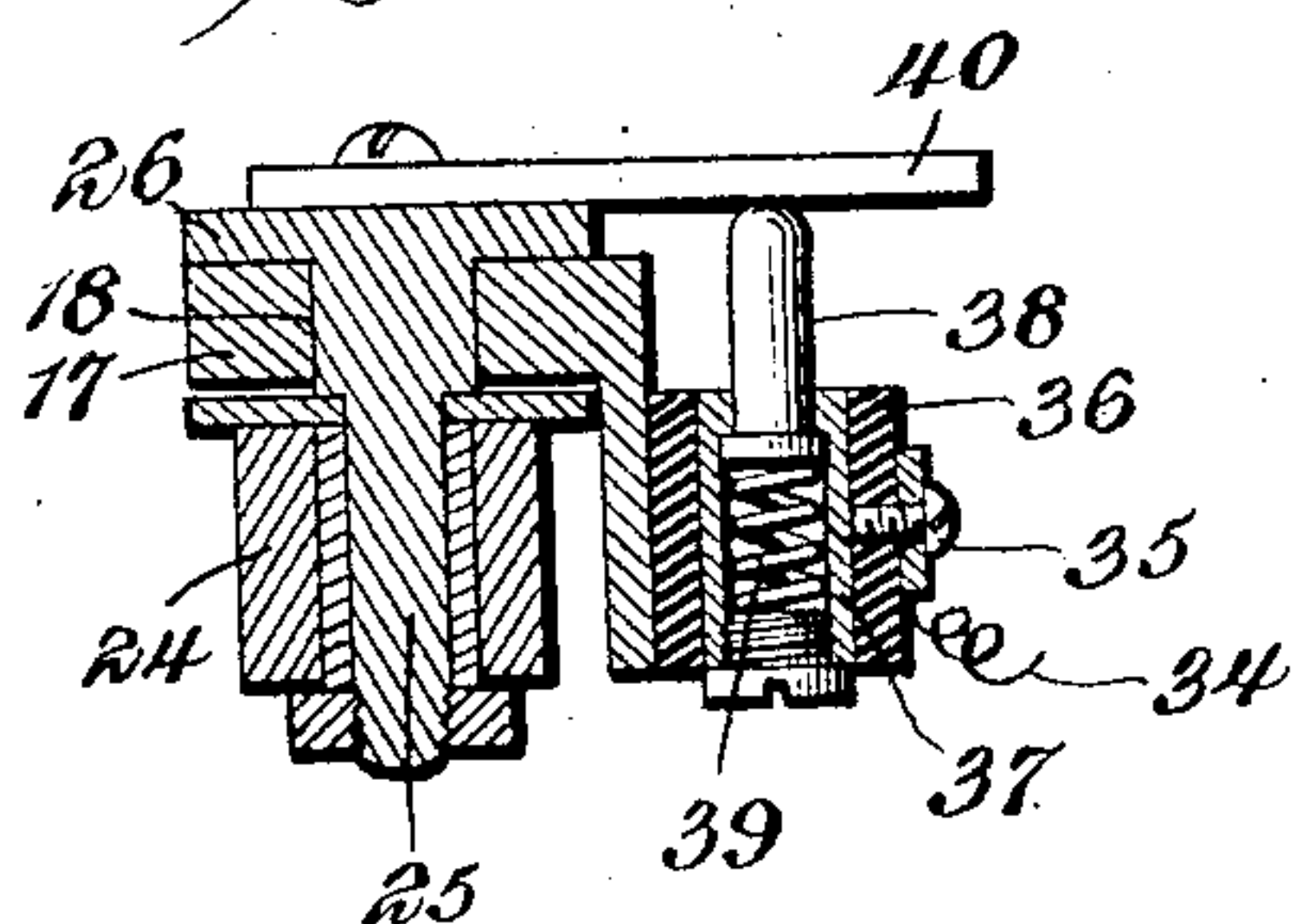


Fig. 4.

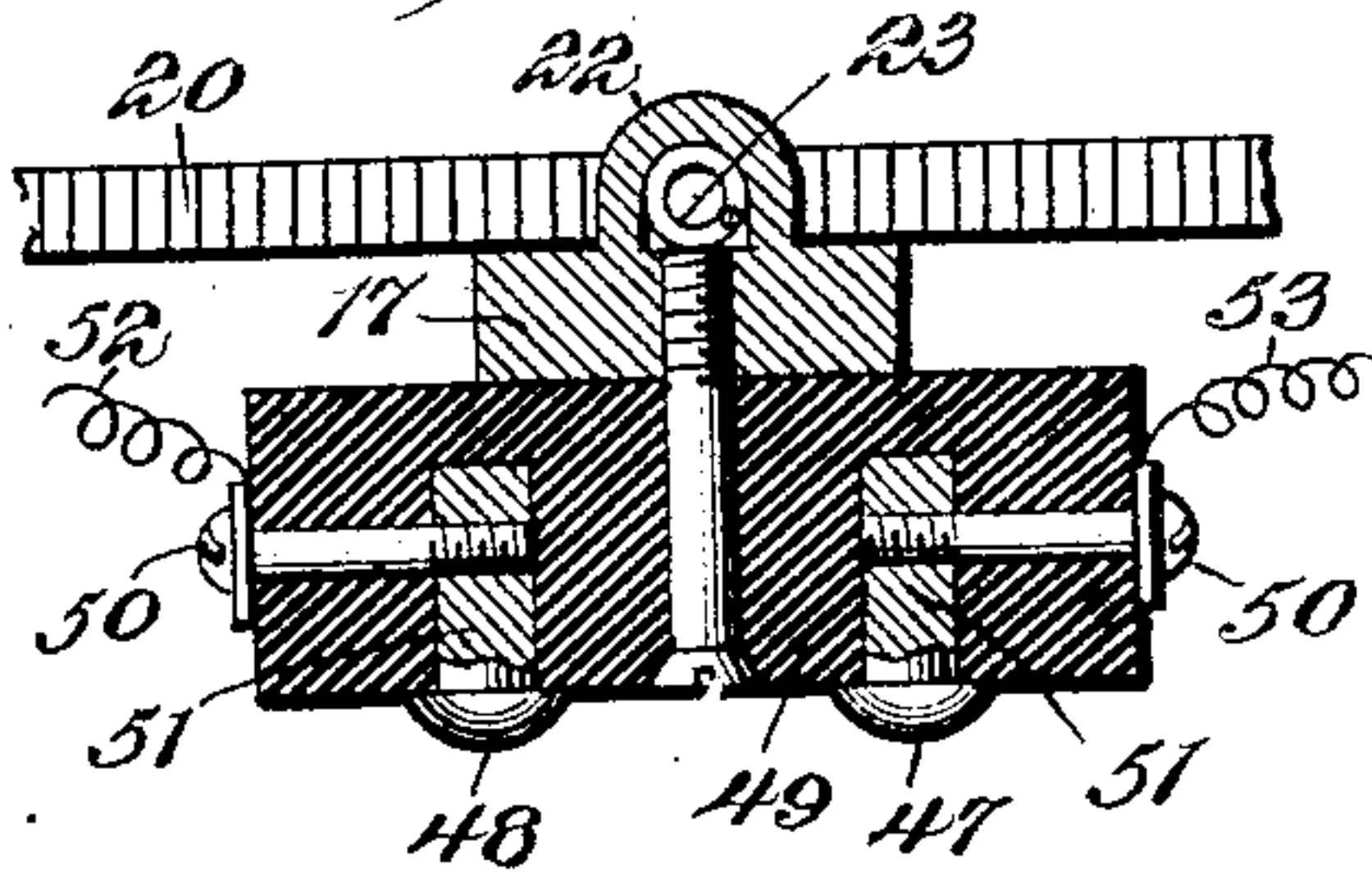


Fig. 5.

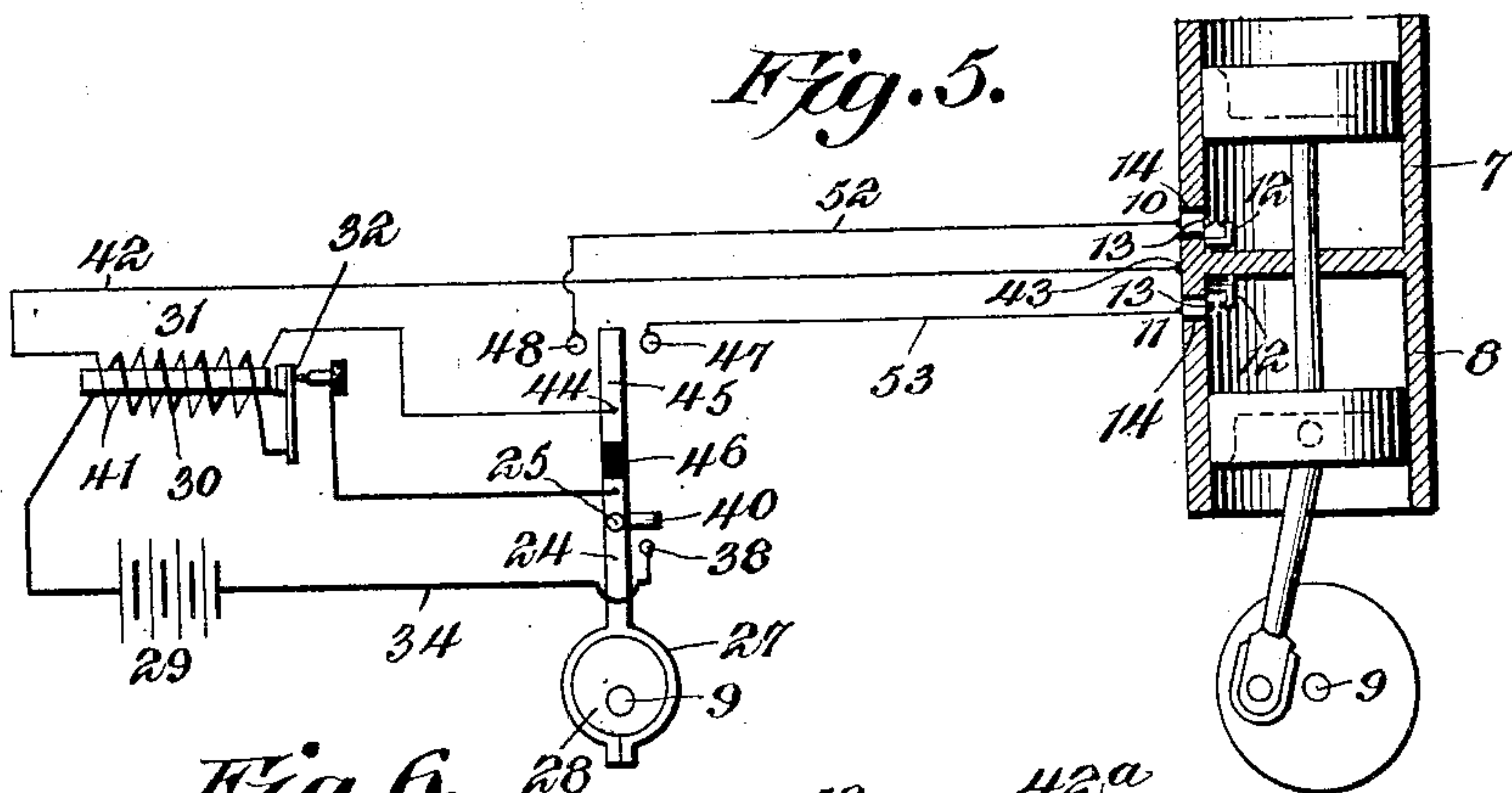
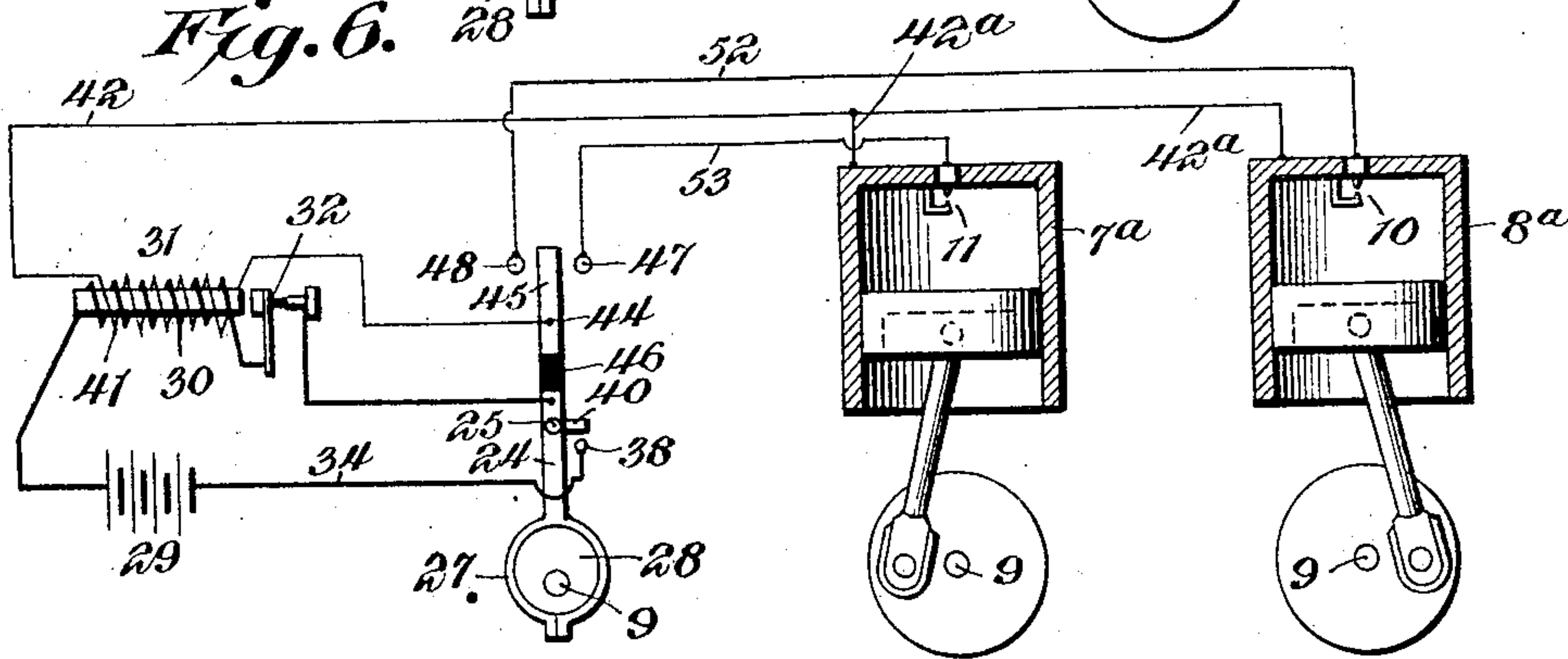


Fig. 6.



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SPARKING IGNITION MECHANISM.

No. 816,472.

Specification of Letters Patent.

Patented March 27, 1906.

Application filed October 19, 1904. Serial No. 229,134.

To all whom it may concern:

Be it known that I, JOHN F. JOHNSON, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented a new and useful Sparking Ignition Mechanism, of which the following is a specification.

The present invention relates to electrical ignition mechanism, and has more particular reference to that employed in connection with jump-spark plugs or igniters.

One of the objects of the invention is to provide switch mechanism for the igniter and operating means therefor that is simple, practical, and is entirely reliable.

Another object is to provide novel means of a simple nature for varying the time of ignition with respect to the movement of the piston.

Still another and very important object is to provide very simple means particularly useful in connection with a plurality of igniters for effecting the successive action of the same from a single source of electric energy without causing the formation of arcs at the switch mechanism.

The preferred embodiment of the invention is illustrated in the accompanying drawings and is described in the following specification; but said invention is not limited to the particular construction herein set forth.

In the drawings, Figure 1 is a view in elevation of an explosive-engine, showing two cylinders in tandem with the improved igniting mechanism, portions of said mechanism being illustrated diagrammatically. Fig. 2 is a vertical sectional view through the switch mechanism. Fig. 3 is a detail horizontal sectional view taken on the line 3 3 of Fig. 1. Fig. 4 is also a detail horizontal sectional view taken on the line 4 4 of Fig. 1. Fig. 5 is a diagrammatic view showing the mechanism. Fig. 6 is another diagrammatic view of a slightly-modified arrangement of parts.

Similar reference-numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated an engine is shown having cylinders 7 and 8; disposed in tandem, the usual pistons of said cylinders being connected to an engine-shaft 9. This engine is of the type fully disclosed in a co-pending application, Serial No. 229,133, and the structure of the same is not important, as the ignition mechanism may be employed in

engines of various forms. Each cylinder is provided with an ignition or sparking plug 10 and 11, preferably of the type known as the "jump-spark," wherein spaced terminals 12 and 13 are employed, as illustrated in Fig. 5, one of said terminals being grounded to the cylinder, the other being insulated therefrom, as shown at 14. In this type of engine it is necessary to successively explode the charges, and therefore to successively create a spark at the igniters. This is accomplished in the present instance by the following mechanism: The crank-shaft case 15 of the engine is provided with a boss 16, that surrounds the engine-shaft, and journaled on this boss is an upwardly-extending lever 17, provided with a longitudinally-disposed slot 18 and having a handle-grip 19 at its upper end. A quadrant-rack 20, secured to the lower engine-cylinder 8 in rear of the lever, is arranged to be engaged by a vertically-movable dog 21, mounted in a seat 22 in the rear portion of the lever and yieldingly urged in a downward direction and into engagement with the rack by a spring 23. The lever can thus be thrown from side to side and will remain in any of its various positions.

An arm 24, extending longitudinally of the lever, carries between its ends a reciprocatory fulcrum-pin 25, that slidably passes through the slot of the lever; said pin having a head 26 at its rear end. The lower end of the arm 24 has a strap 27 surrounding an eccentric 28, carried by the engine-shaft 9. It will thus be apparent that the arm upon the revolution of the shaft has a gyratory movement, or, in other words, swings back and forth and reciprocates at the same time. A source of electrical energy (indicated at 29) has connected thereto a primary circuit including the primary coil 30 of induction apparatus, (shown diagrammatically at 31,) which apparatus includes a vibrator-contact 32. One pole of the primary circuit is grounded, as shown at 33, on the engine-cylinder with which the lever, and consequently the fulcrum, is in electrical connection, while the other terminal or pole has electrical communication, as shown at 34, with a binding-post 35, secured to an insulator-block 36, that is fastened to the lever. This binding-post 35 is in contact with a sleeve 37, within which slides a contact-head 38, yieldingly projected from the rear of the block 36 by a coiled spring 39, disposed in rear of the head.

A flexible contact device in the form of a spring 40 is secured to the rear face of the head 26 of the fulcrum 25, and the head 38 being located in the path of movement of the contact device 40 will be struck thereby during the reciprocation of the fulcrum, thus intermittently closing the primary circuit and inducing a circuit in the secondary coil 41 of the induction apparatus 31. A lead 42 from the secondary coil 41 is grounded, as shown at 43 on the engine, and is thus in electrical connection with the terminals 12 of the igniter's 10 and 11. The other terminal of the secondary coil has electrical connections, as shown at 44, with a contact device in the form of a spring 45, carried by the upper end of the arm 24 and insulated therefrom by a block 46. Coöperating with the contact device 45 are other contact-heads 47 and 48, mounted in an insulator-block 49, that is carried by the upper end of the lever 19. These heads have attached thereto binding-posts 50, which pass through shanks 51, embedded in the insulator-block. One of the binding-posts 50 is electrically connected by a wire 52 with the insulated terminal 13 of the igniter-block 10, while the other binding-post, and therefore the contact-head 47, is in electrical connection, as shown at 53, with the insulated terminal 13 of the plug 11.

From the above it will be clear that the secondary circuit includes besides the induction apparatus the switch consisting of the spring 45 and heads 47 and 48 and that when the spring 45 is in contact with the head 47 the secondary circuit will be closed through the igniting-plug 11, while when the contact device 45 is in engagement with the head 48 the secondary circuit will be closed through the plug 10. Now the contact device 45 of the secondary-circuit switch and the contact device 40 of the primary-circuit switch are so located with respect to each other that upon the movement of the arm under the action of the engine the contact device 45 will always move into engagement with one of the heads 47 48 prior to the engagement of the contact device 40 with the head 38, so that the secondary circuit will always be closed prior to the primary circuit, though both circuits will be in closed condition at the same time. On the other hand, the contact device 40 will move out of engagement with the head 38 before the contact device 45 moves out of co-action with either the head 47 or the head 48. This is an important feature in the operation of the device, for as it is necessary to switch the secondary current from one block to the other successively and it is very desirable to avoid an arc or spark between the contact devices 45, 47, and 48 it is therefore necessary to effect the contacts between these points prior to the closing of the primary circuit, and consequently the generation of the secondary current. This is effectually se-

cured in the present case, for as the engine-shaft rotates the contact-spring 45 will move into engagement with one of the contact devices 47 and 48, and immediately thereafter, due to the reciprocation of the fulcrum 25, the contact device 40 will engage the head 38, thus closing the primary circuit and generating a secondary current in the induction apparatus, which current flowing through the closed circuit will generate the spark at the ignition-plug that happens to be located therein. A continued movement of the arm effects the opening of the primary switch 40 38 and the spring 45 passes from engagement with its coacting head. As soon as these successive movements have taken place the said spring 45 moves quickly to the other contact-head and the same successive operations take place, thereby closing the circuits to make the other ignition-plug operative. Thus it will be seen that upon the downward swinging movement of the arm 24 the secondary circuit will be closed through the plug in one cylinder and current introduced therein to explode a charge in such cylinder and that upon the upward swinging movement of such arm the secondary circuit will be closed through the plug in the other cylinder and a current induced therein to explode a current in said other cylinder.

In order to change the period of ignitions, it is only necessary to swing the lever 17 in one direction or the other, thus changing the relative positions of the contact devices and the paths of movement of those operated by the arm, without, however, altering the succession of contacts made as above described.

The switch mechanisms are very simple, thoroughly reliable, and efficient. The parts may be readily constructed, and while, as already stated, the mechanism is particularly useful in connection with a plurality of sparkers, any number of which can be employed, necessitating merely the increase of contact-heads and connections, it will also be apparent that portions of this mechanism are as clearly applicable for advantageous use in connection with a single igniting device.

As an example of how the structure may be readily modified for use in connection with engines having independent cylinders and pistons or those located side by side instead of tandem attention is invited to Fig. 6. The two cylinders are designated, respectively, 7^a and 8^a. The switch mechanism is exactly the same as that illustrated in Fig. 5, and the same reference-numerals have therefore been applied thereto, the only difference residing in the fact that the lead 42 from the secondary coil has branches 42^a to secure the grounding of said lead on both cylinders.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described invention will be apparent to those skilled in the art without

further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In ignition mechanism, the combination with an engine, of a sparker, induction apparatus having a secondary circuit including the sparker, a source of electrical energy having a primary circuit that includes said induction apparatus, a switch for the secondary circuit including an element alternately movable in reverse directions, a switch for the primary circuit including an element alternately movable in reverse directions, a device for operating the switches to successively close the secondary and primary switches in the order named and open the same in reverse order, and an eccentric device driven by the engine to effect the necessary movements of said device.

2. In ignition mechanism, the combination with an engine, of a sparker, induction apparatus having a secondary circuit including the sparker, a source of electrical energy having a primary circuit that includes said induction apparatus, a switch for the secondary circuit, a switch for the primary circuit, a device for operating the switches to successively close the secondary and primary switches in the order named and open the same in reverse order, said device having a swinging movement and a reciprocatory fulcrum, and an eccentric device driven by the engine and engaging the operating device to effect the necessary movements thereof.

3. In ignition mechanism, the combination with an engine, of a sparker, induction apparatus having a secondary circuit including the sparker, a source of electrical energy having a primary circuit that includes said induction apparatus, a swinging switch-operating device, switch mechanism for closing and opening the primary and secondary circuits, said mechanism including a swinging contact element carried by the operating device and a reciprocating contact element actuated by said operating device, and means for effecting the swinging movement of the switch-operating device to swing and reciprocate said contact elements.

4. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a contact device and a fulcrumed arm having a contact device coacting with the first-mentioned device, means for operating the arm from the engine, means for changing the path of movement of the contact device carried by the arm, and an electric circuit including the switch and sparker.

5. In ignition mechanism, the combination

with an engine, of a sparker, a switch comprising a contact device and a fulcrumed arm having a contact device coacting with the first-mentioned device, means for operating the arm from the engine, means for changing the position of the fulcrum of the arm for varying the path of movement of the contact device carried thereby, and an electric circuit including the switch and sparker.

6. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a stationary contact device and an arm having a sliding fulcrum and a contact device coacting with the first-mentioned device, means for operating the arm from the engine, an adjustable guide for the sliding fulcrum of the arm, and an electric circuit including the switch and sparker.

7. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a laterally-adjustable support, means for holding the support in different lateral positions, an arm pivoted between its ends on the support, a contact device carried by one end of the arm, and another contact device disposed in the path of movement of that carried by the arm, means driven from the engine and connected to the other end of the arm for swinging said arm, and an electric circuit including the switch and sparker.

8. In ignition mechanism, the combination with an engine, of a sparker, a swinging lever, means for holding the lever in different positions, a switch comprising an arm pivoted to the lever and coacting contact devices, one of which is mounted on the lever, the other being mounted on the arm, means operated by the engine for swinging the arm, and an electric circuit including the switch and sparker.

9. In ignition mechanism, the combination with an engine and an engine-shaft, of a sparker, a lever having a fulcrum the axis of movement of which is substantially concentric to that of the engine-shaft, means for holding the lever in different positions, a switch comprising an arm pivoted between its ends upon the lever, an eccentric carried by the engine-shaft and having a connection with one end of the arm and coacting contact devices, one of which is mounted on the lever, the other being carried by the free end of the arm, and an electric circuit including the switch and sparker.

10. In ignition mechanism, the combination with an engine-shaft, of a lever journaled on the shaft, a rack, a dog cooperating with the rack for holding the lever in different relations, an arm movably mounted on the lever, means carried by the shaft and connected to the arm for moving the same, a sparker, a switch comprising coacting elements, one of which is mounted on the lever, the other being mounted on the arm, and an electric circuit for the sparker including the switch.

11. In ignition mechanism, the combina-

tion with an engine-shaft, of a swinging support, means holding the support in different positions against its swinging movement, a sparker, a switch comprising coacting elements, one of which is mounted on the swinging support, the other having a reciprocatory movement on said support, means mounted on the shaft for effecting the reciprocatory movement of said element, and an electric circuit including the switch.

12. In ignition mechanism, the combination with an engine-shaft, of a lever journaled on the shaft, means for holding the lever in different positions against its swinging movement, a sparker, a swinging arm having a fulcrum that reciprocates upon the lever, a switch comprising elements, one of which is mounted on the lever, the other reciprocating with the fulcrum, means mounted on the engine-shaft for swinging the arm and reciprocating its fulcrum, and an electric circuit including the switch.

13. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a contact device, a swinging arm having a pivot-support between its ends, said pivot having a reciprocatory movement and another contact device supported on and carried by the pivot, means connected to one end of the arm and driven by the engine for moving the same, and an electric circuit including the switch and sparker.

14. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a contact device, a swinging arm having a reciprocatory fulcrum that is adjustable transversely of its path of reciprocation and another contact device carried by the fulcrum, means operated by the engine for moving the arm, and an electric circuit including the switch and sparker.

15. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a contact device, a swinging arm having a reciprocatory fulcrum and another contact device carried by the fulcrum, a guide for the fulcrum of the arm, said guide being adjustable transversely of the path of reciprocation of the fulcrum, and an electric circuit including the switch and sparker.

16. In ignition mechanism, the combination with an engine, of a sparker, a switch comprising a contact device, a swinging arm having a reciprocatory fulcrum, a contact device carried by said fulcrum and coacting with the first-mentioned contact device, an adjustable lever having a guideway that receives the fulcrum of the arm, and an electric circuit including the switch and the sparker.

17. In ignition mechanism, the combination with an engine, of a sparker, a swinging arm having a reciprocatory fulcrum that is adjustable transversely of its path of reciprocation, an electrical contact device adjust-

able with the fulcrum and maintained against reciprocation therewith and another electrical contact device operated by the fulcrum and also adjustable with the same, means operated by the engine for moving the arm, and an electric circuit including the switch.

18. In ignition mechanism, the combination with an engine, of spark-generating mechanism including a sparker, a swinging arm having a reciprocatory fulcrum, a contact device movable with the arm, a contact device movable with the fulcrum, other contact devices coacting with said movable devices, and means for swinging and reciprocating the arm.

19. In ignition mechanism, the combination with an engine, of spark-generating mechanism including a sparker, a swinging arm having a reciprocatory fulcrum located between its ends, a contact device carried by one end of the arm, a reciprocatory contact device movable with the fulcrum, other contact devices coacting with said movable devices, and means connected to that end of the arm opposite the one carrying the contact for effecting the movement of said arm.

20. In ignition mechanism, the combination with an engine, of spark-generating mechanism including a sparker, a swinging arm having a reciprocatory fulcrum, a guide for the fulcrum adjustable transversely of its path of movement, sets of coacting contact devices, one of said contact devices being carried by the arm and another by the fulcrum, and means driven by the engine for effecting the movement of the arm.

21. In ignition mechanism, the combination with an engine, of spark-generating mechanism including a sparker, a swinging arm having a reciprocatory fulcrum, a guide for said fulcrum adjustable transversely of its path of reciprocation, sets of coacting contact devices carried by the guide, the arm, and the fulcrum, and means driven by the engine for effecting the movement of the arm.

22. In ignition mechanism, the combination with an engine, of spark-generating mechanism including a sparker, a swinging lever having a guideway, contact devices located on the lever, contiguous to one end and contiguous to the guideway, an arm having a reciprocatory fulcrum operating in the guideway, a contact device carried by the fulcrum, another contact device carried by the arm, and means for operating the arm from the engine.

23. In ignition mechanism, the combination with an engine and engine-shaft, of spark-generating mechanism including independent sparkers, a lever having a fulcrum substantially concentric to the engine-shaft and provided with a longitudinally-disposed slot, contact-heads carried by the free end of the lever and having electrical connections with the sparkers, an arm having a fulcrum

between its ends that is slidably mounted in the slot of the lever, a contact device carried by one end of the arm and successively coacting with the contact-heads of the lever, a cam on the engine-shaft having an engagement with the other end of the arm, another contact-head carried by the lever contiguous to the slot, a contact device carried by the fulcrum and coacting with the last-mentioned head, and means for holding the lever in different positions.

24. In ignition mechanism, the combination with an engine, of a sparker, induction apparatus having a secondary circuit including a sparker, a source of electrical energy having a primary circuit that includes said in-

duction apparatus, a switch for the secondary circuit, a switch for the primary circuit, one of said switches including an oscillating member, the other including a reciprocatory member, and a movable actuating device having a reciprocating portion and an oscillating portion, said portions respectively carrying the reciprocating and oscillating members of the switches.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN F. JOHNSON.

Witnesses:

JOHN H. SIGGERS,
S. GEORGE TATE.